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ABSTRACT

This report focuses on issues relating to replenishing California's college faculty and increasing the number of faculty due to increasing student enrollment. The report provides recommendations for both higher education institutions and the State on 12 policy options that hold promise for increasing the supply of individuals with doctoral degrees and mitigating potential faculty shortages. Nine of the 12 options are "supply-side" interventions, such as increasing baccalaureate production and the share of California baccalaureate recipients entering graduate schools and accelerating efforts to diversify the faculty to include more individuals from historically underrepresented backgrounds. The remaining three options are "demand-side" interventions related to faculty compensation and working conditions. Other parts of the report discuss the growing demand for individuals with doctorates in non-academic and academic job sectors, the projected supply of new faculty nationally and in California, and the need to diversify faculty and progress toward this goal at the national level and in California. Nineteen graphical displays present data used in the analysis. Includes 11 references. (DB)

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PLANNING FOR A NEW FACULTY

ISSUES FOR THE TWENTY-FIRST CENTURY

CALIFORNIA POSTSECONDARY EDUCATION COMMISSION

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Summary

This report focuses on issues relating to replenishing California's college faculty as well as increasing the number of faculty as a result of increased enrollment.

The report has a three-fold aim:

- To provide a general overview of work that has already been conducted on this issue nationally, and in California;
- To highlight several potential policy interventions and broad policy issues that should be incorporated into ongoing State-level discussions of recruitment of the next generation of faculty, as well as expansion in graduate education; and
- To suggest a framework to guide State-level policy makers and educators in continuing discussions on this topic.

Part One of the report on pages 1-8 includes the Commission's suggestions for both the segments and the State on 12 policy options that hold promise for increasing the supply of Ph.D.s and mitigating potential faculty shortages.

Nine of the 12 options are "supply-side" interventions aimed at increasing the availability of advanced-degree recipients for faculty employment: (1) Increase baccalaureate production and the share of California baccalaureate recipients entering graduate schools; (2) Increase the attractiveness and quality of Ph.D. programs by addressing the internal dynamics of these programs that dictate the quality of student life within them; (3) Accelerate diversification efforts; (4) Expand graduate degree production; (5) Make graduate planning comprehensive; (6) Focus program planning on degree production; (7) Identify cost-containment strategies; (8) Emphasize intersegmental planning; and (9) Encourage interstate planning.

The remaining three options are "demand-side" interventions related to faculty compensation and working conditions: (1) Examine assumptions about teaching load; (2) Reexamine policies on use of part-time faculty, including the compensation of part-time faculty; and (3) Reexamine practices related to faculty recruitment and compensation.

The Commission adopted this report at its meeting on September 17, 1990, on the recommendation of its Policy Evaluation Committee. Additional copies may be obtained from the Publications Office of the Commission at (916) 324-4991. Questions about the substance of the report may be directed to Kirk L. Knutsen of the Commission staff at (916) 322-8013.

PLANNING FOR A NEW FACULTY

Issues for the Twenty-First Century

California's Projected Supply of New Graduate Students in Light of Its Need for New Faculty Members

CALIFORNIA POSTSECONDARY EDUCATION COMMISSION
Third Floor • 1020 Twelfth Street • Sacramento, California 95814-3985

COMMISSION REPORT 90-20
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1 *Mitigating the Coming Faculty Shortage*

Origins of the report

Planning for significant growth in higher education is continuing on all fronts in California. Projections of demographic growth show a likely need to accommodate 700,000 more students by the year 2005 than now. The California Community Colleges anticipate 40 percent growth in their enrollment; the California State University for at least 30 percent more students; and the University of California may need to plan for 36 percent more undergraduates and is already preparing plans for as much as 80 percent growth in its graduate enrollment.

Much work has already been completed in responding to this anticipated need for growth (see, for example, *Higher Education at the Crossroads: Planning for the Twenty-First Century*, published by the Commission this past January). But not all of this planning focuses on enrollment increases, the expansion of existing campuses, and the creation of new campuses or off-campus centers. Program planning -- not just for growth, but for renewal and improvement -- is ongoing throughout higher education. Among the many important of these issues is the recruitment of a new faculty for the twenty-first century -- the topic of this report.

In addition, the issue of faculty planning is central to program planning in higher education. The reasons for this fact may be obvious, but they deserve at least brief review here:

- The first reason is because of what faculty members do: instruction, research, and public service. Through their instructional and research missions, California's faculty members train much of tomorrow's skilled work force and replenish their own ranks by training the next generation of faculty.
- Second are reasons of program quality: Faculty members -- their individual interests, skills, and talents -- form the core of the academic program. The quality of the faculty is synonymous with the quality of the program.
- Third are reasons of resource management: Personnel typically constitute 85 percent of any academic institution's instructional budget, with the faculty payroll the largest single component. From a resource management perspective, a faculty appointment constitutes a lifetime investment. Therefore, it is essential that the decisions surrounding this investment -- related to recruitment, promotion, and retention -- are wisely made.
- The fourth and final reason relates to policy, including the policy goals of educational equity. The recruitment of a new faculty -- from whom the academic leaders of tomorrow will be drawn -- is how California will either meet or fail to meet its priorities for educational diversity. This issue is not limited to the sex or ethnicity of new faculty members but extends to their individual and collective commitment to principles of diversity, equity, and academic excellence as equal partners in creating the intellectual climate of tomorrow's colleges and universities.

Scope of the analysis

This report does not aim to answer all the interrelated questions associated with faculty replenishment, including graduate studies and Ph.D. production, or even to provide an exhaustive analysis of the research that has been conducted on these questions. Rather, it has a four-fold aim:

- To highlight several potential policy interventions and broad policy issues that should be incorporated into ongoing State-level discussions of faculty replenishment and expansion in graduate education;
- To suggest a framework to guide State-level policy makers and educators in continuing discussions on this topic;

- To provide a general overview of work that has already been conducted on this issue nationally, and in California; and finally
- To focus attention on the policy imperative of diversifying the graduate student and faculty ranks.

Potential policy interventions

In many ways, planning for new faculty and planning for graduate education are two halves of the same whole. In the context of faculty replenishment, graduate education planning should be directed in part toward identifying *supply-side interventions*, or strategies that aim at increasing the availability of advanced degree recipients for academic employment. Conversely, faculty planning can be seen as identifying *demand-side interventions* related to faculty compensation and working conditions. These demand-side strategies aim to improve the management and/or productivity of the faculty itself, in order to mitigate the need for new faculty.

Outlined below are several potential strategies organized into these two broad categories.

Supply-side interventions

1. *Increase baccalaureate production and increase the share of California baccalaureate recipients entering graduate schools.*

The ability to maintain an adequate flow of quality faculty is strongly influenced by the effectiveness of undergraduate programs. The success with which institutions encourage their undergraduates to pursue graduate programs should be seen as an important component of the faculty replenishment process. It is therefore essential that institutions focus renewed attention on providing adequate numbers of bachelor degree recipients to fill the doctoral pipeline.

With national baccalaureate production projected to decline in the next ten years, ensuring an increased supply of qualified baccalaureate recipients is a necessary part of plans to move forward to expand graduate education. California's substantial undergraduate growth projections are at deviance with the national trends, and offer the State the opportunity to maintain adequate numbers of graduate students if sufficient numbers of undergraduates can be convinced to pursue advanced degrees.

For its part, and as part of the Commission's ongoing empirical analysis of the flow of students through the educational system, the Commission plans to improve the quality of available information on the retention and attrition of students, by sex, ethnicity, and field of study, through undergraduate education and into graduate school. This analysis will examine critical points of leakage in the educational pipeline through the doctoral level. In addition, as part of its continuing effort to evaluate the effectiveness of State policies and programs for student retention, the Commission is expanding its work of examining the efficiency and effectiveness of programs designed to increase undergraduate student retention.

There is some evidence that the greatest undergraduate productivity, efficiency, and quality are achieved on campuses whose mission and resources are focused primarily on undergraduate instruction. As a result, a continuing examination of the factors contributing to excellence and productivity at both the graduate and undergraduate levels appears warranted. Particular emphasis should be placed on examining whether or not the institutional characteristics contributing to excellence at each level are complementary, or in some cases might actually be mutually exclusive.

2. *Increase the attractiveness and quality of Ph.D. programs by addressing the internal dynamics of these programs that dictate the quality of student life within them.*

2.1 *Improve financial aid:* For students with options other than graduate education, the costs associated with obtaining the doctorate are very high. Lost years of employment income from the private sector or government while obtaining the degree, as well as only moderate improvement in expected lifetime earnings as a result of the doctoral degree are both facts of life for prospective graduate students. When the financial pressures graduate students face

as a result of eroding financial aid and the dramatic shift away from grant aid and toward loans are added to this equation, small wonder that graduate education has been steadily losing out to the private sector over the past decade. Increased grant aid for graduate students must be part of the solution. In addition, improved graduate aid also holds promise for enhancing doctoral productivity, because it will allow a portion of the student body to focus more on their academic work and less on earning a living.

2.2 *Shorten time-to-degree:* Simply stated, shortening time-to-degree for the Ph.D. offers the opportunity to increase the productivity of doctoral education, resulting in a more efficient and hence less expensive operation for the State. While shortening time-to-degree alone will not solve the projected Ph.D. shortage, it is one of the few alternatives that result in net cost savings to the State, and as such should be pursued vigorously.

To these ends, and in response to Senate Concurrent Resolution 66 (Hart), the Commission is currently studying the issue of time-to-degree to the doctorate and the options available to shorten time to degree in order to attract a larger, higher quality, and more diverse pool of applicants to graduate programs. It is expected that this study will result in specific recommendations related to shortening time to degree, and in addition will suggest additional areas of inquiry which appear to hold promise for contributing to the broader policy goals embodied in Senate Concurrent Resolution 66.

2.3 *Improve retention:* Similar to time-to-degree, improving retention (or, conversely, lowering attrition) will result in a more efficient and less costly operation. In most cases, persons who drop out of doctoral programs for reasons other than their academic competence represent to the State an investment gone bad. When students drop out, not only does the State lose the subsidy associated with supporting their enrollment, but high opportunity costs are absorbed as well, because other students were not occupying those enrollment slots and moving successfully toward a degree. Once again, some attrition should and always will exist. However, the State's ability to encourage improvement in this area represents one way in which degree productivity can be enhanced, allowing limited State resources to be used to maximum effect.

2.4 *Improve the campus climate:* While less tangible and more difficult to address, available evidence indicates that the climate in which graduate students work bears directly and substantially on the quality and productivity of their work (California Postsecondary Education Commission, 1990c). If students feel they are not being welcomed or supported adequately in a program, the risks of attrition increase significantly. While time-to-degree and available financing bear directly on the formation of these students' attitudes, the faculty itself also bears a large portion of the responsibility for student perceptions of the quality of programs. Strategies aimed at improving the general level of satisfaction with students' graduate programs may have potential for improving graduate recruitment efforts, improving retention, and accelerating time-to-degree.

The Commission is currently well underway in its study to assess the perceptions of campus climate in California higher education. The aim of this study is to determine the feasibility for developing and implementing an assessment system to measure the extent to which "institutional policies, programs, practices, attitudes, and expectations . . . encourage the achievement of appropriate educational goals by all students at the institutions, in particular women and students from minority groups traditionally underrepresented in higher education" [Assembly Bill 4071 (Vasconcellos, 1988)]. While efforts in these areas clearly need to be intensified by all parties in the educational community, the preceding studies do appear to hold promise for spurring institutional reforms which could substantially improve the attractiveness of graduate programs for all students, particularly those from backgrounds historically underrepresented in higher education.

3. *Accelerate diversification efforts.*

Long-range planning efforts in graduate education must also be fully integrated with diversification efforts at all levels of the educational pipeline. Students from historically underrepresented backgrounds comprise the fastest growing portion of California's college-age population, but if they are not encouraged to attend and succeed in undergraduate programs in much higher numbers than is now the case, the number of college graduates will be insufficient to fill available graduate school slots.

In addition, if success in diversification is not achieved hand in hand with graduate expansion, then the new generation of faculty that will be hired in the coming years will not be substantially more diverse than the last, and it may not be until the mid-twenty-first century that the opportunity to diversify will arise again.

To address this issue as well as to respond to Senate Concurrent Resolution 106 (Watson), the Commission plans in the coming year to conduct a comprehensive study that will identify critical points in the process from graduate school admission through tenure appraisal that affect the composition of the faculty; specify programs, practices, and policies that have demonstrated the capacity to enhance progress in diversifying the faculty; and develop policy recommendations for promoting progress in diversifying the faculty.

4. *Expand graduate degree production*

The final option the State must consider is to increase graduate enrollments. The Commission has already stated that increases in graduate enrollments will be necessary in the coming years, but defining the specific level of needed growth should be done only after consideration of all other alternatives. After all, the level of needed expansion is largely dependent upon assumptions relating to the productivity of graduate education, and unless that assumption is going to be "business as usual," projections of enrollment needs can only be accomplished after determining the potential associated with other alternatives. This will be true for both the University of California's doctoral programs, as well as the California State University's master's degree programs. The Commission plans to further define its estimates of the needed level of growth in graduate education as it responds to the revised long-range growth plans of the University of California and the California State University as they become available. Nonetheless, national estimates project substantial faculty shortages within the next decade, continuing strong demand for Ph.D.s in the private sector, and a need for doctoral production in the arts and sciences to increase by approximately two-thirds over this period to provide adequate numbers to meet anticipated demand. In addition, a recent National Science Foundation study points to more than a doubling in demand for natural scientists and engineers in academic and non-academic sectors combined, over the 22 years ending 2010. The University of California has been one of the first institutions in the nation to initiate intensive planning activities in response to these trends, and it is currently proposing that graduate enrollment be increased by 80 percent over the next 15 years, largely to address these projected shortages.

While there may be marginal disagreements over the magnitude of the need and of the potential of various interventions to mitigate that need, it is still obvious that increases in California's doctoral production will be necessary if faculty and private sector demand for Ph.D. recipients in California are going to be met in the twenty-first century. In addition, in light of the community colleges' dramatic enrollment growth and faculty turnover estimates, it does not appear likely that the State University's current projection of only 8 percent growth in graduate enrollments will be sufficient to meet the demand for master's degree recipients from this segment. As a result, California should prepare for substantial expansion in graduate education in both of its public university segments. Part of this planning should include attention to the role of the independent sector in graduate and professional education.

5. *Make graduate planning comprehensive.*

As planning moves forward on expansion in graduate education, attention to needed programmatic reforms must be accelerated and integrated with this planning for growth. Strategies aimed at improving student achievement levels, lowering attrition, and decreasing time-to-degree can contribute substantially to improving both the quality and efficiency of graduate programs. As such, these ap-

proaches should not be addressed piecemeal but should be fully integrated with planning for expansion.

6. *Focus program planning on degree production.*

Thus far the University of California has defined its goals with respect to meeting increased demand for doctoral recipients in terms of needed increases in graduate enrollment levels. However, graduate enrollment is at best an indirect measure of the State's ability to meet future demand for Ph.D.s. In order to link graduate enrollments to doctoral demand it is necessary to make a variety of assumptions regarding student achievement levels (attrition and time-to-degree) before it is possible to translate enrollment into Ph.D.s conferred. If the planning process does not include a careful examination of ways in which doctoral production can be enhanced short of increasing enrollments (such as lowering attrition and shortening time-to-degree), then embedded within the University's link between enrollments and degrees conferred is the assumption that current achievement patterns will remain largely unchanged. Given current attention to the issues of graduate attrition and time-to-degree, and the opportunity for reform that this growth period provides, this would not be a prudent approach.

Instead, an alternative analytic framework might be in order. If the University of California's primary planning unit for doctoral growth were changed from "graduate enrollment" to "Ph.D. degrees conferred," then the link between the State's goal of meeting future demand for Ph.D.s would be much more clear and direct. In addition, by starting with goals defined in terms of degrees conferred, analysis of strategies aimed at lowering attrition and time-to-degree could be more easily conducted, and their effect on enhancing doctoral production could be more meaningfully examined. Various assumptions regarding the potential of lowering attrition and time-to-degree could then be applied to generate ranges of enrollment levels needed to generate sufficient doctorates.

This suggested framework obviously should not be considered the sole analytic approach for examining graduate education or production goals. Academic quality is not measured by degrees conferred, nor should it be. Many components go into academic planning for graduate education besides estimation of Ph.D. demand, and these should continue. Besides, California's interests will not be served if it comes to be seen as something of a Ph.D. degree mill. On the other hand, among the key issues confronting the State in this area -- faculty replenishment, faculty diversity, meeting private sector demand, lowering graduate attrition, shortening time-to-degree, and improving the achievement of underrepresented groups -- analysis of all of them is substantially easier if "Ph.D. degrees conferred" is the basic planning unit. Since the University is predicating its current graduate expansion proposals largely on projected demand for doctoral recipients, the preferred approach appears to be defining goals and analyzing policy alternatives in terms of their effect on the number of doctoral degrees conferred.

7. *Indentify cost-containment strategies.*

State financial constraints will be a major consideration in proceeding with planned expansion in graduate education. Efforts should proceed hand in hand with expansion planning to identify and, where possible, implement cost-containment strategies that will not adversely effect educational quality.

7.1 *Identify potential cost savings:* Further complicating an already difficult situation are serious questions about the State's ability to finance needed growth in higher education. While it is always incumbent that public institutions provide their services as efficiently as possible, the current and apparently long-term financial problems facing California will require that growth in graduate education be accompanied by a thorough search for effective cost-containment strategies. One of the things that the State must plan for in order to accommodate growth, while improving access and maintaining quality, is more efficient use of existing resources. In the coming year, the Commission plans to explore policy incentives available to the State to encourage cost-containment strategies and the prudent management of resources, without hurting academic and program quality. Options for such an agenda include efforts to reduce administrative costs, incentives to the segments to contain costs through decentralized resource management, and State-level de-

regulation of unnecessary controls, accompanied by attention to accountability and performance.

With the current State financial picture and the substantial growth requirements facing all educational segments, careful examination of these sorts of options should be expected from educational decision makers.

7.2 *Protect educational quality:* The State must also take care that budgeting and other planning decisions related to graduate education pay special attention to the need to preserve and, in fact, to improve the quality of education at the University of California and the California State University.

There are two facets to this issue: First, the attention of educational planners to graduate and research program expansion should not take their attention away from the need to enhance undergraduate education. Since improvements in one need not come at the expense of the other, a dilution of attention to undergraduate education is not inevitable. Nonetheless, it is important that planners consider how their planning processes can ensure enhancement of quality across all instructional levels.

Second is the question of resource availability to support graduate program increases. Graduate education has historically been more expensive than undergraduate education, although the State actually budgets fewer resources for graduate enrollment increases than undergraduate. Unless the State of California is willing to increase per-student support for graduate education in order to ensure that graduate growth does not come at the expense of funding for undergraduate education, then expansion of graduate education could force a diversion of faculty and other resources away from the undergraduate level.

8. Emphasize intersegmental planning.

As should now be apparent from this report, there is a tight interrelationship between faculty demand in California's various educational segments and needed production of advanced degree recipients from the University of California, the California State University, and independent institutions with these programs. Close ties therefore need to be established between the graduate program and faculty planning elements of these segments so that each can be informed by the plans and projections of the others. This should be considered an essential component of the graduate and faculty planning processes of each of the segments. In the absence of such cooperative and intersegmental planning, building an efficient and comprehensive plan for avoiding projected shortages of faculty will be very difficult, and the risk of segmental plans that are inefficient, duplicative, and uninformed of the needs and intentions of other segments will be heightened.

While the segments should maintain ongoing communication with each other regarding progress in these planning activities, for its part the Commission will maintain its Technical Advisory Committee on Long-Range Planning and will convene this group, as appropriate, to provide a forum in which segmental planners and Commission staff can keep each other apprised of developments at the segmental and State level. In addition, this group will be used as a forum in which continuing staff-level discussions on intersegmental long-range planning issues can take place.

9. Encourage interstate planning.

The problems and challenges of preparing for a new faculty are not limited to California; as Part Two of this report shows, the projected undersupply of qualified personnel for new faculty positions is a national phenomenon. California has historically recruited a significant number of new faculty from other states, and California Ph.D. recipients have gone out-of-state as well. The picture needs to be cast in a national, and not just in a state context. More needs to be done to ensure collaboration between the nation's major research universities and the federal government on this important national agenda, which needs to include urgent attention to expanded student financial support. In addition, the issues of graduate program productivity -- including attrition, time-to-degree, and the need for educational diversity -- are ones that are on the agendas of institutions throughout the country. It will be important for California institutions to continue to collaborate with their colleagues across the country on these issues. This kind of collaboration is commonplace at the individual faculty and pro-

gram level, but it may not yet be adequately recognized, supported, or understood by State policy makers.

Demand-side interventions relating to faculty compensation and working conditions

An important facet of the equation influencing the need for new faculty is the set of operating assumptions related to the patterns of hiring, promoting, retaining, and compensating faculty members, including policies on faculty workload. Most planning that has been done to date assumes that current practices related to faculty employment will continue unchanged. One exception to this tendency at the University of California has been its projections for an approximate 5-percent improvement in the overall number of teaching positions assigned to ladder-rank faculty members. Yet apart from this exception, the University's plans appear to be built largely upon the assumption of continuing current policies and practices. While this is entirely valid for preliminary planning purposes, it seems worthwhile at this early stage to take a critical look at these assumptions. To do so gives the State and its postsecondary educational institutions the opportunity to reevaluate and reembrace the fundamental underpinnings of academic personnel policy that will dictate not just the quality but also the size, shape, cost and, ultimately, the productivity of the teaching and research faculty.

What follows is a brief list of employment and compensation issues that deserve some examination in this regard:

1. *Examine assumptions about teaching load.*

- While the California State University has recently done a good deal of work examining faculty workload, it has been some time since the State of California has undertaken a comprehensive faculty workload survey, and therefore current policies and practices with respect to faculty teaching responsibilities are not widely known for all segments. It is important for the State and for individual institutions to revisit these issues sometime in the near future, in order to ensure that the policies and practices are sufficient to meet the challenges of the future.

A variety of important issues affected by overall faculty teaching and workload policies are likely to be forced to the surface during the coming period of rapid turnover. Without prejudging the issue, it is reasonable to postulate that several things have happened in most academic institutions over the past 15 to 20 years:

- First, there has probably been a tendency for the older faculty to shift into teaching senior-level courses (upper-division, graduate, and professional), as well as to reduce teaching responsibilities overall.

- Second, the pursuit of faculty "research stars" has resulted in an increased willingness to recruit faculty with the promise of minimal teaching responsibilities. This practice carries substantial long-term risks. First, hiring faculty with guarantees of minimal or no teaching responsibilities tends to degrade teaching as a prestigious and coequal activity when compared to research. Second, expanded use of this practice has the costly effect of forcing an increased reliance on irregular rank faculty and teaching assistants to carry out instructional activities.

- Third, this tendency has probably been accompanied by some impaction of faculty positions in fields where current enrollment demand may be low, so that needed faculty appointments are not necessarily in the same discipline areas as recent student enrollment demand. (This latter phenomenon may be one of the reasons for an increase in the use of part-time faculty to assume teaching responsibilities.)

As senior faculty members retire, there will be an opportunity for new appointments to be made in areas of current enrollment demand, which will result in a net reallocation of positions away from some fields and toward others. This will probably influence the aggregate need for new faculty and may have the effect of decreasing demand for new doctorates in some disciplines while exaggerating it in others. Absent some ground rules on teaching responsibilities, the process of deciding where new positions are allocated could be the cause of extreme

tension between campus departments as well as between campuses in systems.

2. *Reexamine policies on use of part-time faculty, including the compensation of part-time faculty.*

It has become conventional academic thinking that the use of part-time faculty in colleges and universities both diminishes academic quality and exploits the part-time faculty. While none would argue that overuse of part-time faculty is desirable, it is a rebuttable presumption that any use of part-time faculty is an academic and personnel abuse. If shortages of full-time teaching personnel develop as predicted, then institutions will have to choose between making no appointments, shifting teaching responsibilities to other regular faculty, appointing lesser credentialed individuals, or using irregular-rank faculty, including part-time faculty, to get the job done.

The Commission has recently begun a study of part-time and irregular-rank faculty in postsecondary education in California. The goal of that study is to establish a basis of fact about this group of professionals that should form the foundation for policy discussions about how this resource should be used in the future. Issues such as teaching policies, compensation, opportunities for part-time work as a prelude to permanent appointments, as well as the patterns of use of part-time faculty by field and level of instruction will be the focus of this effort.

3. *Reexamine practices related to faculty recruitment and compensation.*

The segments have undertaken a good deal of work in the past that addresses how they and the State might improve the faculty recruitment process, in order to give California a competitive advantage over other states in hiring new faculty. It will be important to revisit these issues and to raise them to the level of State policy in order to ensure that California has the most aggressive faculty recruitment practices of any state in the nation. Examples of the kinds of innovations that have been tried and can be shown to be successful include:

3.1 *Front-load faculty funding:* Front-load funding for faculty in anticipation of future shortages allows institutions to recruit and bring on board top-quality faculty members even if specific positions for them have not yet been freed up through turnover or growth. Used most extensively to enhance recruitment for high-demand faculty, this practice also provides the State with a good option for making progress in the goals of educational diversity.

3.2 *Housing or other high-cost allowances:* With some exceptions, the use of the single faculty salary scale in the University of California and the California State University has discouraged the use of high-cost area compensation packages, including housing or other special cost-of-living allowances in high-cost areas.

3.3 *Spousal placement services:* More and more junior faculty -- both men and women -- come from two-income families. If California is to be successful in recruiting junior faculty from out of state, then more needs to be done to offer help with the professional placement of faculty spouses. These kinds of services have been common in the past with faculty "stars" in research universities that have had the resources to support such efforts, but they could be expanded and made more common.

It is the Commission's belief that the preceding strategies and issues are important enough and show enough promise to warrant serious consideration as faculty planning efforts continue. The Commission hopes and expects that as institutions and the State continue their planning activities, these alternatives will receive the serious attention they deserve.

2 *The Growing Demand for New Faculty*

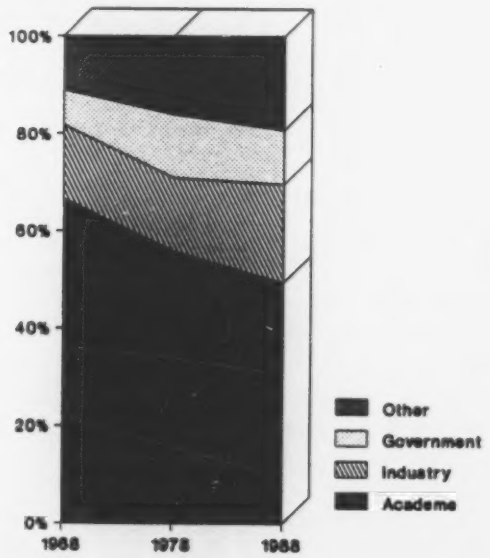
Demand in non-academic job sectors

Most people may think that being a faculty member is the primary employment option for a new Ph.D. graduate, but this is no longer the case. Employment of doctoral recipients in the non-academic sectors (government, business, and industry) is growing steadily. Any projection of the demand for Ph.D.s must therefore examine both the academic and non-academic job markets.

In 1968, only 33 percent of all American Ph.D.s were employed in fields other than academe -- for example, in business or government. By 1988, however, that figure had increased to over 50 percent (Displays 1 and 2). In fact, as of 1988, 64 percent of all Ph.D.s in the physical sciences worked in non-academic fields, along with 71 percent of all engineering Ph.D.s, and 55 percent of all Ph.D.s in the social sciences.

When considering how to avert projected faculty shortages, it might seem easy to develop a strategy of recapturing at least part of this Ph.D. market from non-academic employment sectors, and, indeed, some recapture may occur naturally as the job market in academic employment continues to improve. However, this approach may not be a major alternative to increasing Ph.D. production. Doctoral education contributes greatly to the health and vitality of a wide variety of non-academic employment sectors, and the contributions of Ph.D.s outside academia have been enormous in areas such as the space program, medical research, genetic engineering, and the development of new electronics technologies -- to name just a few. Given the salaries available to Ph.D.s in many of these fields, it will be difficult for higher education to compete successfully for a substantially larger share of current Ph.D. production. Moreover, a number of Ph.D. recipients choose non-academic employment for non-economic reasons related to job opportunity, flexibility, and the like.

DISPLAY 1 Employment Sector in the U.S. Labor Force, 1968 to 1988 (U.S. Citizens and Permanent Residents)



Source: National Research Council, 1989, p. 43.

Demand in the academic job market

The national demand

The most current and comprehensive analysis of college faculty supply and demand in the United States has been prepared by William G. Bowen president of the Andrew Mellon Foundation, and Julie Ann Sosa and was published last year by Princeton University Press as *Prospects for Faculty in the Arts and Sciences*. Bowen and Sosa estimate that from 1987 to 2012, total faculty openings in these fields will range from a low of 150,496 to a high of 181,315, or from between 6,020 to 7,250 per year (Display 3, page 11). Of these projected openings, Bowen and Sosa estimate that between 83 and 97 percent (or from 146,228 to 155,484 positions) will be generated by replacement demand resulting

DISPLAY 2 ***Employment Sector of Doctorate Recipients with Employment Commitments in the United States, by Major Field, 1968, 1978, and 1988 (U.S. Citizens and Permanent Residents)***

	Employment Sector											
	Academe			Industry			Goverment			Other		
Field of Doctorate	1968	1978	1988	1968	1978	1988	1968	1978	1988	1968	1978	1988
Total All Fields												
Number	9,858	8,189	6,580	2,184	2,216	2,701	1,092	1,815	1,422	1,661	2,311	2,520
Percent	66.6	56.4	49.8	14.8	15.3	20.4	7.4	12.5	10.8	11.2	15.9	19.1
Physical Sciences												
Number	1,323	596	523	913	711	723	247	227	171	157	38	28
Percent	50.1	37.9	36.2	34.6	45.2	50.0	0.0	14.4	11.8	0.0	2.4	1.9
Physics/Astronomy	52.1	25.9	26.1	25.0	46.9	48.2	16.1	24.1	23.4	6.7	3.1	2.3
Chemistry	29.5	18.4	15.3	58.9	71.4	77.7	4.9	7.7	5.0	6.7	2.5	2.0
Earth, Atmospheric, Marine	50.7	33.2	39.3	25.9	36.1	30.4	17.8	27.9	29.5	5.6	2.9	0.9
Mathematics	79.9	70.8	75.9	12.6	19.1	19.0	3.7	8.2	2.3	3.9	1.9	2.8
Computer Sciences	NA	58.2	56.6	NA	35.8	32.7	NA	6.0	8.8	NA	0.0	1.8
Engineering												
Number	621	252	360	876	613	702	198	188	190	169	21	12
Percent	33.3	23.5	28.5	47.0	57.1	55.5	10.6	17.5	15.0	9.1	2.0	0.9
Life Sciences												
Number	1,059	800	650	189	277	297	225	221	211	135	58	95
Percent	65.9	59.0	51.9	11.8	20.4	23.7	14.0	16.3	16.8	8.4	4.3	7.6
Biological Sciences	68.0	60.9	47.7	9.0	17.7	27.1	13.0	16.4	18.0	9.9	5.0	7.2
Health Sciences	56.8	62.9	63.1	23.7	17.2	13.8	6.8	14.5	12.5	12.7	5.5	10.6
Agricultural Sciences	62.2	53.7	44.3	16.1	26.7	30.8	19.3	17.3	20.4	2.4	2.4	4.4
Social Science (including Psychology)												
Number	1,784	1,741	1,178	114	286	506	251	475	372	219	475	556
Percent	75.3	58.5	45.1	4.8	9.6	19.4	10.6	16.0	14.2	9.2	16.0	21.3
Psychology	61.0	40.0	29.6	6.5	12.4	24.6	17.0	20.7	16.5	15.6	26.9	29.3
Other Social Sciences	85.1	76.2	66.2	3.7	6.9	12.3	6.3	11.4	11.1	4.9	5.5	10.4
Humanities												
Number	2,568	1,688	1,336	16	100	98	32	78	62	118	178	189
Percent	93.9	82.6	79.3	6.0	4.9	5.8	1.4	3.8	3.7	4.3	8.7	11.2
Education												
Number	2,104	2,263	1,651	32	149	277	120	544	340	832	1,406	1,501
Percent	68.1	51.9	43.8	1.0	3.4	7.3	3.9	12.5	9.0	26.9	32.2	39.8
Professional/Other												
Number	399	849	882	44	80	98	19	82	76	31	135	139
Percent	80.9	74.1	73.8	8.9	7.0	8.2	3.9	7.2	6.4	6.3	11.8	11.6
Business and Management	84.6	87.0	90.0	9.1	7.9	7.0	1.9	4.3	2.6	4.4	0.8	0.4
Communications	88.9	83.9	81.9	8.3	9.3	8.1	0.0	4.1	2.0	2.8	2.6	8.1

Note: Percentages are based on responses to postgraduation plans. Only doctorates with definite commitments for employment are included. Foreign locations are excluded.

Source: National Research Council, 1989, p. 42.

DISPLAY 3 Components of National Faculty Demand Projections: Four Models of Net New Positions and Replacement Demand

Model and Component	1987-92	1992-97	1997-2002	2002-07	2007-12	Total 1987-2012
Model I						
Replacement Demand	26,863	26,436	28,453	32,026	32,450	146,228
New Positions	-8,193	-2,349	8,590	5,781	439	4,268
Total Demand	18,670	24,087	37,043	37,807	32,889	150,496
Model II						
Replacement Demand	26,863	26,671	28,472	32,086	32,553	146,645
New Positions	-6,485	-3,617	8,619	5,800	440	4,757
Total Demand	20,378	23,054	37,091	37,886	32,993	151,402
Model III						
Replacement Demand	26,863	27,630	29,706	33,355	34,059	151,613
New Positions	501	-323	9,305	6,263	475	16,221
Total Demand	27,364	27,307	39,011	39,618	34,534	167,834
Model IV						
Replacement Demand	26,863	27,727	31,379	34,313	35,202	155,484
New Positions	1,209	11,286	6,181	6,650	505	25,831
Total Demand	28,072	39,013	37,560	40,963	35,707	181,315

Notes:

In Model I, continuing declines in arts-and-sciences shares of enrollment are combined with declining student/faculty ratios.

In Model II, steady-state projections of arts-and-sciences shares of enrollment are combined with constant student/faculty ratios.

In Model III, steady-state projections of arts-and-sciences shares of enrollment are combined with declining student/faculty ratios.

In Model IV, recovery projections of arts-and-sciences shares of enrollment are combined with increasing student/faculty ratios.

Source: Bowen and Sosa, 1989, p. 126.

from retirement and other forms of faculty attrition. The remaining openings (between 4,268 and 25,831) are expected to result from the expansion of higher education enrollments. This variance of 21,560 positions in their estimates of new positions -- a multiple of more than six -- stems largely from uncertainties related to the direction of change in enrollment and student/faculty ratios nationally. One important caveat with regard to this study is that the Bowen and Sosa study was restricted to (1) doctorate holding faculty, (2) faculty in the arts and sciences, and (3) faculty at four-year institutions. Accordingly, the number of faculty positions of which their analysis is based constitutes no more than one-third of the nearly 700,000 full-time faculty members nationally, and does not take into account the nearly 250,000 additional part-time faculty members. Thus, while Bowen and Sosa's data are very important, their projections apply to only a small (albeit vital) portion of the academic labor market. The likely shortfalls in the number of qualified faculty in most fields are therefore likely to be substantially higher than the Bowen and Sosa projections suggest.

Bowen and Sosa maintain that faculty shortages of Ph.D.s in the humanities and social sciences are inevitable under even the most optimistic assumptions, unless the number of doctorates produced in these disciplines is increased substantially. In addition, a recent survey by the American Council on Education (1989) found that among doctoral-granting institutions, current shortages are being reported in computer science (60 percent of institutions),

business (60 percent), and engineering (40 percent). Shortages in these institutions are expected to materialize within the next five years in the fields of mathematics (50 percent), physical sciences (50 percent), biological sciences (30 percent), and foreign language (30 percent). These shortages are largely the result of stagnant Ph.D. production, coupled with accelerating faculty retirement rates, increased demand for doctoral recipients in the private sector, and marginally increasing enrollment levels.

Demand in California

Estimates of faculty demand in California largely mirror national trends, except that while the national picture is tempered by relatively stable undergraduate enrollment, California faces a much higher proportion of faculty demand because of an estimated 40 percent growth in undergraduate enrollment between 1988 and 2005 (California Postsecondary Education Commission, 1990a). The following paragraphs discuss this demand separately for each of the State's major segments of higher education -- the University of California, the California State University, the California Community Colleges, and California's independent colleges and universities.

University of California: Long-range projections that the Office of the President presented to the Regents in October 1988 and updated in February of this year foresee an additional 10,400 ladder-rank faculty positions in the 17 years from 1989-90 through 2005-06, or 612 new hires per year. These projections include:

		Percent of Total
Replacements of faculty (no growth)	6,960	67%
Growth at existing campuses	2,670	26%
New campuses	770	7%
Total faculty hires	10,400	100%

These projections assume that the University will add three new campuses between now and 2005, but as can be seen, the faculty hires related to new campuses represent only 7 percent of the University's total estimated faculty demand. In addition, these projections assume that the University will reduce its reliance on temporary non-ladder rank faculty by lowering the proportion of temporary faculty from approximately 20 percent of the total faculty currently to approximately 15 percent in 2005.

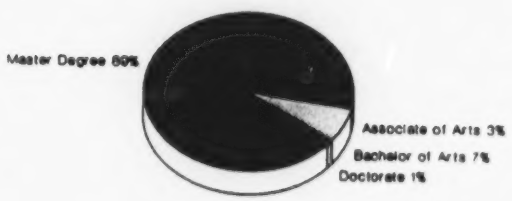
The California State University: The most recent estimates available from the California State University anticipate a total demand to the year 2005 of between 8,500 and 11,000 new faculty created by exits and growth, equivalent to between 570 and 670 new hires per year during the next 15 years. This compares with an average of 450 annual faculty hires over the past 15 years. The greatest immediate hiring needs are reported to be new faculty in the humanities, education, mathematics, and science, although more social science faculty are also expected to be hired. Among discipline groups, the largest number of new faculty hires -- 2,100 -- is projected for the humanities. These projections by the State University assume enrollment growth consistent with Department of Finance projections. If the higher internal enrollment projections of the State University materialize, then additional new faculty positions will be needed.

California Community Colleges: The California Community Colleges are planning for enrollment growth of approximately 540,000 students over the next 15 years, although their specific enrollment plans, and their related plans for faculty diversification and hiring are still in the developmental stage. The Chancellor's Office of the California Community Colleges is currently refining a long-range enrollment plan on a regional basis, but there is general agreement that it will show dramatic aggregate growth.

Preliminary projections estimate total faculty hiring in the community colleges from 1990 to 2005 at 22,205 full-time-equivalent positions. Of this total, 12,347 vacancies are expected in order to replace existing faculty, and the remaining 9,858 will result from enrollment growth. The Chancellor's Office plans to refine these estimates further as it moves forward with its long-range planning activities, but clearly both of California's public universities can expect growing demand into the foreseeable future for master's degree and doctoral-level graduates as community college faculty. This will occur at the same time that other institutions will be demanding increased numbers of doctoral-degree recipients from the University of California.

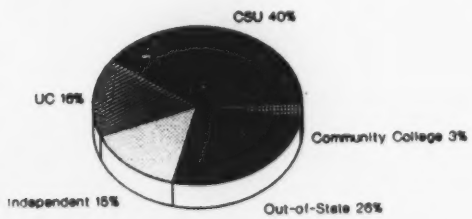
Master's degree recipients must be considered a central component in faculty planning for the community colleges, since the academic profile of the community college faculty is much different from those of the University of California and the State University. A recent survey by the Chancellor's Office estimates that 87 percent of all community college faculty held a master's degree at their time of hire, while only 1 percent had a doctoral degree (Display 4). Approximately 40 percent of these faculty members received their highest degrees from the California State University, compared with only 16 percent from the University of California, 15 percent from California's independent institutions, 26 percent from out-of-state institutions, and 3 percent from the community college segment itself (Display 5).

DISPLAY 4 Highest Degree of California Community College Faculty when Hired, 1988



Source: Chancellor's Office, California Community Colleges.

DISPLAY 5 Source of Highest Degree Held by California Community College Faculty when Hired, 1988



Source: Chancellor's Office, California Community Colleges.

Independent Institutions: Less is known about projected faculty demand in California's independent colleges and universities than its public institutions, but the latest available estimates from the Association of Independent California Colleges and Universities indicate that there are approximately 11,300 full-time-equivalent faculty working in the Association's 64-member institutions, with approximately 70 percent having received a Ph.D. degree.

No comprehensive surveys have been conducted of projected faculty turnover in these institutions, but the largest of them -- the University of Southern California -- anticipates that roughly two-thirds of its faculty will retire by the year 2000. This estimate is in line with other projections for similar institutions, and adds credence to the assumption that California can expect similar faculty turnover patterns in its independent institutions as in its public sector. By applying a conservative faculty turnover assumption (40 percent) to the total faculty of the independent sector (11,300), it is possible to estimate a potential replacement demand of 4,520 faculty in these institutions. If 70 percent of this demand is for positions requiring the Ph.D., the independent institutions will need approximately 3,200 doctoral recipients. Moreover, increased faculty demand related to net enrollment growth should be expected in independent institutions if market conditions are favorable enough to warrant such expansion. In short, despite a lack of specific and comprehensive data, all indications are that faculty demand in independent institutions, especially those comparable to the University of California and the California State University, will increase sharply in the coming decade. (A detailed discussion of the potential for enrollment growth in independent institutions can be found in the Commission's Technical Background Paper 5 to *Higher Education at the Crossroads* (1990b)).

All in all, California can expect to need approximately 48,000 new faculty through 2005 -- or some 3,200 a year across all four of its major segments of higher education. About half of this projection of needed faculty should be expected to have obtained the Ph.D. degree.

As a result, high demand for Ph.D.s in government and the private sector will likely persist, heightening competition for prospective future faculty members. Regardless, at this preliminary planning phase, and until indications to the contrary become

evident, there appears no alternative but to assume that competition for Ph.D. recipients in the private sector will persist relatively unabated.

3 *The Projected Supply of New Faculty*

FOR WELL over a century, doctoral education has been a major contributor to the economic, social, and cultural vitality of America, especially in California. Doctoral programs have provided a substantial portion of the intellectual muscle that helps sustain the State's diverse, growing, and increasingly international economy, and they also carry out State-funded research efforts, constantly pushing back the frontiers of human knowledge in the medical sciences and the many other academic fields whose purpose is to improve the human condition. Most importantly, doctoral education provides a major portion of California's faculty work force: the educators who will train the political, business, and social leaders of tomorrow.

The national supply of Ph.D.s

Over the past decade the number of Ph.D. degrees awarded by American universities increased slightly -- from 30,875 in 1978 to 33,456 in 1988; but as Display 6 on page 16 shows, the number of U.S. citizens earning Ph.D.s over this period declined steadily -- from 25,291 in 1978 to 23,172 in 1988 -- a drop of 8 percent. The number of women receiving the doctorate who were American citizens grew over the decade (Display 7, page 17), but the number of their male counterparts dropped sharply -- from 17,936 to 13,667 (Display 8, page 18). Among male American citizens, Whites registered the largest numeric decline, from 15,573 to 12,296, while Blacks experienced the greatest percentage decline -- a drop of 47 percent, from 584 to 311.

In the face of these declines in the number of American citizens earning doctorates, the slight increase in national Ph.D. enrollment can be explained by increasing numbers of foreign students in these programs. Display 6 shows that the number of foreign students with temporary visas who earned Ph.D.s in the United States increased from 3,421 in 1978 to 6,176 in 1988 -- an increase of 81 percent. In 1978, these doctoral recipients accounted for 11 percent of total degrees conferred, while by 1988 this figure had increased to over 18 percent.

The problem is not that there are too many foreign Ph.D. recipients. Rather, there are too few American citizens earning the doctorate. There is no evidence to indicate that foreign graduate students are displacing qualified American students who want to enter Ph.D. programs. On the contrary, foreign graduate students enrich the academic environment in American universities. The skills provided by these students are helping to buy time to deal with the shortages of domestic Ph.D. students.

The softness of demand by domestic students for doctoral programs is probably attributable to several factors that together make doctoral study a high financial and professional risk for many students.

- The tight academic job market has been the most obvious problem, since the most coveted jobs in the best locations have not been readily available.
- Also, the most talented students -- who would be the best candidates for doctoral education -- are the most in-demand students outside of the faculty marketplace, where the salaries, options to work in a particular geographic area, and promotional opportunities are frequently better than what is available in colleges and universities.
- The length of the process can also be a turn-off to many students: the average time to degree (10.5 total years is the average across all disciplines) is simply too long to defer the start of a professional career for many students.
- Finally, the graduate educational experience itself is one that, while intrinsically rewarding to some students, can be very difficult, and even degrading to others, probably contributing to high attrition rates in graduate programs (see, for example, Breneman, 1970; Knutsen, 1987; and National Research Council, 1989). Especially for first-generation college students who may not have the family or financial support to complete

DISPLAY 6 All Ph.D. Recipients by Race/Ethnicity and Citizenship, 1978-1988

Status	Year of Doctorate										
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Total Men and Women	30,875	31,239	31,020	31,357	31,106	31,280	31,332	31,291	31,896	32,367	33,456
U.S. Citizen	25,291	25,464	25,221	25,061	24,388	24,358	24,026	23,363	23,081	22,991	23,172
Permanent Resident	1,344	1,320	1,291	1,281	1,228	1,275	1,224	1,324	1,432	1,578	1,611
Temporary Resident	3,421	3,587	3,644	3,940	4,204	4,499	4,830	5,229	5,275	5,609	6,176
American Indian	61	84	75	85	77	82	74	95	100	116	93
U.S. Citizen	60	81	75	85	77	81	74	95	99	115	93
Permanent Resident[1]	-	-	-	-	-	1	-	-	-	-	-
Temporary Resident[1]	1	3	-	-	-	-	-	-	1	1	-
Asian	2,394	2,402	2,421	2,711	2,904	3,124	3,394	3,642	3,728	4,126	4,771
U.S. Citizen	390	428	458	465	452	492	512	516	531	542	612
Permanent Resident	642	674	644	608	552	551	507	553	528	625	621
Temporary Resident	1,311	1,463	1,472	1,564	1,829	2,006	2,295	2,526	2,645	2,933	3,510
Black	1,384	1,445	1,445	1,491	1,526	1,382	1,494	1,440	1,270	1,217	1,246
U.S. Citizen	1,033	1,056	1,032	1,013	1,047	922	953	912	823	767	805
Permanent Resident	73	58	74	97	96	83	102	131	126	139	146
Temporary Resident	270	320	331	372	373	363	419	395	313	305	289
Latino/Hispanic	842	900	821	931	920	969	918	1,001	1,056	1,056	1,045
U.S. Citizen	473	462	412	464	535	539	536	561	572	619	594
Permanent Resident	65	77	73	62	79	69	71	73	107	91	99
Temporary Resident	289	348	328	389	294	342	300	361	372	338	346
White	23,754	23,682	23,805	23,926	23,657	23,831	23,399	22,874	22,767	22,709	23,053
U.S. Citizen	21,811	21,920	21,993	21,980	21,677	21,699	21,349	20,757	20,626	20,470	20,685
Permanent Resident	531	476	468	490	463	545	514	534	596	654	668
Temporary Resident	1,372	1,263	1,331	1,432	1,458	1,539	1,493	1,567	1,505	1,563	1,676
Unknown Race/Ethnicity	2,440	2,526	2,253	2,213	2,022	1,892	2,053	2,239	2,975	3,143	3,248
U.S. Citizen	1,524	1,517	1,251	1,054	600	625	602	522	430	478	383
Permanent Resident	33	35	32	24	38	26	30	33	75	69	77
Temporary Resident	178	190	182	183	250	249	323	380	439	469	355

Note: Totals for racial/ethnic groups include doctorates with unknown citizenship status.

1. In most cases, non-U.S. American Indians are citizens of Canada or of Latin American countries.

Source: Adapted from National Research Council, 1989, p. 15.

graduate school, the choice of doctoral study has both high risks and costs.

Bowen and Sosa estimate that the number of Ph.D.s available for academic employment nationally will decline from 32,538 for the years 1987-92 to 30,934 for 2007-12. The result, under both their high-demand and low-demand models, is a severe projected deficit of Ph.D.s available for faculty employment for the years 2002-07 (Displays 10 and 11, pages 20 and 21). Over that period, Bowen and Sosa estimate a best-case scenario in the national Ph.D. deficit of 6,873 and a worst case deficit of 10,029. For example, by applying California's current share of Ph.D.s working in the State (13 percent) to these projected Ph.D. deficits, it is possible to estimate that California can expect a shortage of between

DISPLAY 7 Female Ph.D. Recipients by Race/Ethnicity and Citizenship, 1978-1988

Status	Year of Doctorate										
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Total	8,322	8,937	9,407	9,892	10,093	10,533	10,699	10,744	11,306	11,426	11,790
U.S. Citizen	7,355	7,884	8,346	8,701	8,829	9,239	9,297	9,146	9,448	9,410	9,505
Permanent Resident	292	306	319	308	313	322	332	325	365	461	453
Temporary Resident	455	495	490	553	583	627	698	834	861	887	4,056
American Indian	10	25	29	29	33	31	20	56	41	53	42
U.S. Citizen	10	25	29	29	33	31	20	56	41	53	42
Permanent Resident[1]	-	-	-	-	-	-	-	-	-	-	0
Temporary Resident[1]	-	-	-	-	-	-	-	-	-	-	0
Asian	422	444	470	488	549	582	614	697	687	777	933
U.S. Citizen	103	117	145	150	171	180	174	187	183	173	199
Permanent Resident	111	110	131	109	108	120	118	116	111	170	164
Temporary Resident	197	210	190	223	262	275	313	389	387	428	561
Black	481	547	574	567	615	549	591	589	564	516	560
U.S. Citizen	449	505	533	514	564	509	526	533	501	450	494
Permanent Resident	8	6	11	17	15	10	21	14	20	21	25
Temporary Resident	18	32	26	33	33	24	37	41	38	44	40
Latino/Hispanic	211	222	229	274	270	334	297	355	390	378	367
U.S. Citizen	156	154	156	189	191	251	222	261	269	286	273
Permanent Resident	13	25	25	15	27	24	24	23	36	41	34
Temporary Resident	38	38	48	68	47	54	48	67	83	50	59
White	6,579	7,022	7,494	7,891	8,082	8,523	5,628	8,417	8,811	8,822	8,971
U.S. Citizen	6,238	6,659	7,145	7,521	7,690	8,090	8,179	7,952	8,323	8,298	8,389
Permanent Resident	152	157	142	159	154	164	164	167	186	213	220
Temporary Resident	175	195	201	207	216	252	267	295	291	305	353
Unknown Race/Ethnicity	619	677	611	643	544	514	549	630	813	880	917
U.S. Citizen	399	424	338	298	180	178	176	157	131	150	108
Permanent Resident	8	8	10	8	9	4	5	5	41	16	10
Temporary Resident	27	20	25	22	25	22	33	42	62	60	43

Note: Totals for racial/ethnic groups include doctorates with unknown citizenship status.

1. In most cases, non-U.S. American Indians are citizens of Canada or of Latin American countries.

Source: Adapted National Research Council, 1989, p. 17.

900 and 1,300 faculty for all institutions for the years 2002-07, assuming parity in recruitment efforts and recruitment success among the states. (These are *not* cumulative deficits for the total 15- or 20-year periods but apply only to this five-year peak period in a longer 25-year period of rising demand and static supply.) These figures are almost certainly an understatement of the total shortfall, since they include only full-time arts and sciences faculty with the Ph.D. degree teaching in four-year institutions. For California's colleges and universities that recruit faculty with Ph.D. degrees, this translates into an inability to fill between 180 and 260 Ph.D. faculty openings per year for this period. And these projections underestimate still further the extent of the likely shortage because California is growing faster than the rest of the nation, implying that California's share of total demand will in-

DISPLAY 8 Male Ph.D. Recipients by Race/Ethnicity and Citizenship, 1978-1988

Status	Year of Doctorate										
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Total	22,553	22,302	21,613	21,465	21,013	20,747	20,633	20,547	20,590	20,941	21,666
U.S. Citizen	17,936	17,580	16,875	16,360	15,559	15,119	14,729	14,217	13,633	13,581	13,667
Permanent Resident	1,052	1,014	972	973	915	953	892	999	1,067	1,117	1,158
Temporary Resident	2,966	3,092	3,154	3,387	3,621	3,872	4,132	4,395	4,414	4,722	5,120
American Indian	51	59	46	56	44	51	54	39	59	63	51
U.S. Citizen	50	56	46	56	44	50	54	39	58	62	51
Permanent Resident[1]	-	-	-	-	-	1	-	-	-	-	-
Temporary Resident[1]	1	3	-	-	-	-	-	-	1	1	-
Asian	1,972	2,158	2,151	2,223	2,355	2,542	2,780	2,945	3,041	3,349	3,838
U.S. Citizen	287	311	313	315	281	312	338	329	348	369	413
Permanent Resident	531	564	513	499	444	431	389	437	417	455	457
Temporary Resident	1,114	1,253	1,282	1,341	1,567	1,731	1,982	2,137	2,258	2,505	2,949
Black	903	898	871	924	911	833	903	851	706	701	686
U.S. Citizen	584	551	499	499	483	413	427	379	322	317	311
Permanent Resident	65	52	63	80	81	73	81	117	106	118	121
Temporary Resident	252	288	305	339	340	339	382	354	275	261	249
Latino/Hispanic	631	378	592	657	650	635	621	646	666	678	678
U.S. Citizen	317	308	256	275	344	288	314	300	303	333	321
Permanent Resident	52	52	48	47	52	45	47	50	71	50	65
Temporary Resident	251	310	280	321	247	288	252	294	289	288	287
White	17,175	16,660	16,311	16,035	15,575	15,308	14,771	14,457	13,956	13,887	14,082
U.S. Citizen	15,573	15,261	14,848	14,459	13,987	13,609	13,170	12,805	12,303	12,172	12,296
Permanent Resident	379	319	326	331	309	381	350	367	410	441	448
Temporary Resident	1,197	1,068	1,130	1,225	1,242	1,287	1,226	1,272	1,214	1,258	1,323
Unknown Race/Ethnicity	1,821	1,849	1,642	1,570	1,478	1,378	1,504	1,609	2,162	2,263	2,331
U.S. Citizen	1,125	1,093	913	756	420	447	426	365	299	328	275
Permanent Resident	25	27	22	16	29	22	25	28	63	53	67
Temporary Resident	151	170	157	161	225	227	290	338	377	409	312

Note: Totals for racial/ethnic groups include doctorates with unknown citizenship status.

1. In most cases, non-U.S. American Indians are citizens of Canada or of Latin American countries.

Source: Adapted National Research Council, 1989, p. 16.

crease, rather than remain constant. This estimate is finally understated because a perfect supply-and-demand balance would provide one Ph.D for every faculty opening, whereas experts maintain that 1.3 candidates per opening is the ideal ratio.

California's supply of Ph.Ds

California's accredited independent institutions provide a large number of doctoral recipients: 1,503 of them in 1988 -- a 20 percent increase over the 1,244 they graduated in 1980 -- and some 40 percent of California's total doctoral production. Similarly,

DISPLAY 9 Registered and Total Median Years to Degree for Ph.D. Recipients, by Demographic Group and Broad Field, 1988

Status	Field of Doctorate							
	All Fields	Physical Sciences[1]	Engineering	Life Sciences	Social Sciences	Humanities	Education	Professional and Other
Registered Years to Degree								
All Ph.D.s	6.9	6.1	5.9	6.5	7.4	8.5	8.1	7.3
Men	6.7	6.2	5.9	6.5	7.3	8.3	8.2	7.3
Women	7.4	6.0	5.8	6.7	7.5	8.7	8.0	7.4
Permanent Residents	7.0	6.6	6.2	6.7	8.0	7.5	7.6	7.8
Temporary Residents	6.2	6.1	5.8	6.2	6.8	7.2	6.2	6.4
U.S. Citizens[2]	7.2	6.1	5.9	6.6	7.5	8.7	8.3	7.6
Asians	7.0	6.4	6.1	6.9	7.8	8.5	8.4	8.5
Blacks	8.1	6.5	6.1	6.6	8.1	9.0	8.6	7.8
Latinos/Hispanics	7.4	6.4	5.8	6.4	7.8	9.4	8.3	7.5
Whites	7.2	6.1	5.8	6.6	7.4	8.7	8.3	7.5
Total Years to Degree								
All Ph.D.s	10.5	7.4	8.1	8.9	10.5	12.2	16.9	13.0
Men	9.7	7.5	8.2	8.6	10.3	11.9	16.5	12.6
Women	12.3	7.3	7.0	9.3	10.9	12.6	17.2	14.0
Permanent Residents	10.0	8.6	8.9	10.0	11.2	10.9	12.9	11.6
Temporary Residents	9.3	8.5	8.4	9.7	9.9	10.8	12.9	10.5
U.S. Citizens[2]	11.0	7.1	7.5	8.6	10.5	12.5	17.3	14.0
Asians	9.9	7.9	8.7	8.3	10.5	12.6	19.7	15.0
Blacks	14.9	7.8	8.3	10.4	11.0	14.3	17.9	16.0
Latinos/Hispanics	10.9	7.1	7.7	7.7	10.0	13.0	16.2	15.0
Whites	10.9	7.0	7.4	8.6	10.5	12.4	17.3	13.8

1. Includes mathematics and computer sciences.

2. American Indians are not shown because their numerical distribution among fields was too small for averages to be meaningful.

Source: Adapted National Research Council, 1989, p. 24.

the California State University produces a large number of master's degree recipients itself as well as a few Ph.D.s through its joint doctoral programs with other universities.

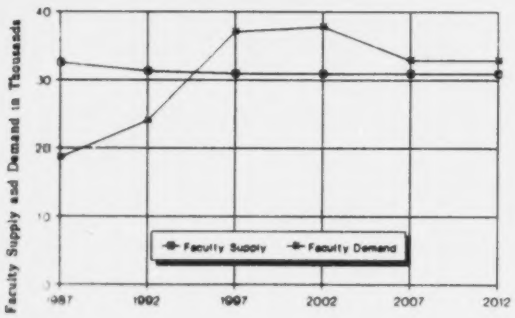
The graduate enrollment plans of these institutions are essential to adequate statewide graduate enrollment planning, and the Commission will discuss them later in this paper, but the unique role of the University of California in increasing the supply of doctoral recipients requires substantial initial comment here.

University of California

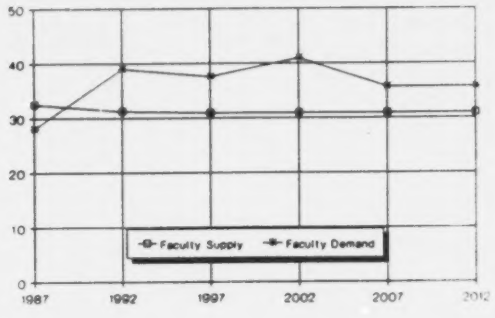
The University is designated in the Master Plan for California Higher Education as the public segment solely responsible for conferring the Ph.D. degree and the segment primarily responsible for conduct-

DISPLAY 10 Faculty Supply and Demand in the Arts and Sciences Nationally, 1987-2012, Under the Most Optimistic and Pessimistic Conditions Anticipated by Bowen and Sosa

Low Demand (Model I)



High Demand (Model IV)



Model and Component	1987-92	1992-97	1997-2002	2002-07	2007-12	Total 1987-2012
Projected Supply[1]	32,538	31,299	30,934	30,934	30,934	156,639
Low-Demand (Model I)						
Projected Demand	18,670	24,087	37,043	37,807	32,889	150,496
Supply - Demand	13,868	7,212	-6,109	- 6,873	- 1,955	6,143
Supply/Demand[2]	1.74	1.30	0.84	0.82	0.94	
High-Demand (Model IV)						
Projected Demand	28,072	39,013	37,560	40,963	35,707	181,315
Supply - Demand	4,466	- 7,714	- 6,626	- 10,029	- 4,773	-24,679
Supply/Demand	1.16	0.80	0.82	0.76	0.87	

Note: All data are for five sectors only. The demand projections are taken from Appendix Tables D.8-D.11. The supply projections are from Table 7.1 and Appendix Table D.7.

1. The same supply projections used with both models assume continuing decline in the shares of new doctorates seeking academic careers.
2. The supply projection divided by the demand projection is the number of candidates per position.

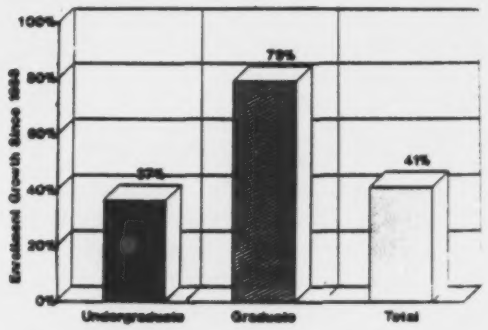
Source: Adapted from Bowen and Sosa, 1989, pp. 128-129.

ing research activities. In October 1988, the Regents reviewed preliminary projections for the University that suggested up to three new campuses might be needed by the year 2005. Planning for expansion is now underway on the University's existing campuses through development of a series of individual campus Long-Range Development Plans designed to set their enrollment ceilings. Once this process is completed, the Regents will identify what additional capacity the University will need, and they will then take final steps to propose potential new campuses -- possibly sometime later this year.

Based on its preliminary plan, the University expects to accommodate 43,287 new undergraduates by 2005, as well as 20,881 graduate students, which computes to a growth rate of 36.5 percent for undergraduates and 79.0 percent for graduate enrollments (Display 11, page 21).

Unlike the University's undergraduate enrollment plan, its graduate plan is not demographically

DISPLAY 11 Proposed University of California Enrollment Growth to 2005, Indexed to 1988 Levels



Source: California Postsecondary Education Commission, 1990a, p. 24.

driven, but is proposed as a policy and planning priority in order to meet the University's stated goal of increasing the proportion of graduate students from the current 18.2 percent to 22.7 percent in 2005. Moreover, since the recruitment pool for the University's graduate students is national and in many ways international, projections based on California demographic trends do not play a major role in the University's graduate enrollment planning.

The University has proposed that the State establish, through implementation of its Graduate Enrollment Plan, minimum graduate student ratios of 20 percent on each campus in the system, including the three proposed new campuses. This would result in a minimum of one new graduate enrollment allocated for each four new undergraduates, depending on the campus.

The University's current systemwide graduate student ratio of 18.2 percent is substantially below that of the 1970s, when demand for graduate enrollments began to slacken and the proportion of undergraduate enrollment increased. The University has since been attempting to increase graduate enrollments and has met with some resistance from the Legislature in this regard. In 1987, as a result of a legislative request, University officials prepared a comprehensive graduate enrollment plan that proposed graduate enrollment ratios of between 19.8 and 21 percent of total enrollment. The University has not released a revised graduate enrollment plan that justifies the newly proposed graduate ratio of 22.7 percent, although one is currently in progress that has an expected completion date of late this year. However, through application of the new graduate enrollment proposal, the University has already proposed major increases in graduate enrollments on several campuses. Specifically, it anticipates increasing graduate enrollment at Irvine by 212 percent, at Riverside by 169 percent, at San Diego by 186 percent, and at Santa Cruz by 379 percent.

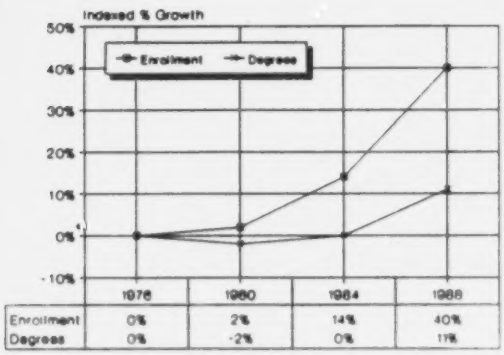
The University's primary justification for this proposed growth in graduate enrollments has been the need to train graduate students to replenish projected faculty retirements and provide faculty to accommodate projected growth. However, to date, the University has not been able to directly link this need for new faculty with the number of graduate enrollments needed to ensure an adequate supply of Ph.D.s in the future. The problem exists in part because the University's faculty applicant pools are national and international in character. The University's own Ph.D. graduates provide a substantial but by no means exclusive source of faculty for the University itself and for California's other institutions of higher education. As a result, both the University's 1987 and 1988 graduate enrollment plans represent its best "guesstimates" in those years of needed future graduate enrollments.

Looking over the past decade, the enrollment of students aiming for Ph.D. degrees in the University grew from 12,825 in 1976 to 17,979 in 1988 -- an increase of 40 percent. During the same period, however, the number of doctoral degrees conferred rose from 2,068 to 2,297 -- an increase of only 11 percent. While some of this gap between growth in enrollment and degrees conferred may be explained by the lag time that exists between enrollment increases and degree production (due to the time it takes to earn the degree), these data still indicate a need to look more closely at issues of productivity in graduate education.

A close look at these data indicates that contrary to national trends, the enrollment of U.S. citizens in the University of California's Ph.D. programs increased by over 24 percent between 1976 and 1988 -- growing from 10,591 to 13,027. However, Ph.D.s conferred to this same group increased by only 5.5 percent over the same period, rising from 1,714 to 1,808. Enrollment in these same programs by for-

eign graduate students increased by over 114 percent between 1976 and 1988, moving from 2,234 to 4,798, while Ph.D.s conferred to foreign graduate students increased by 38 percent (Displays 12 and 13). It is likely that a good deal of the gap between enrollment increases and degree production can be accounted for by the time it takes for these new students to graduate.

DISPLAY 12 Comparison of University of California Ph.D. Enrollment with Ph.D. Degrees Conferred, 1976-1988



Source: California Postsecondary Education Commission IPEDS Data Base, 1976-1988.

The California State University

In light of projections of community college faculty demand, and the historic reliance the community colleges have placed on State University master's degree recipients to fill that demand, the California State University's graduate programs must play a major role in helping to meet California's faculty demand in the twenty-first century.

Due to the differentiation of segmental functions outlined in California's Master Plan for Higher Education, the University of California is the sole public institution authorized to confer the doctorate degree. However, the State University still produces a substantial number of advanced degree holders, largely through its master's degree programs. In fact, it is California's largest producer of advanced degree recipients. In 1980, it enrolled 34,005 students in master's programs and conferred 9,732 master's degrees, and in 1988, it enrolled 36,078 students in these programs and conferred 8,960 master's degrees. These figures represent 6 percent growth in enrollment and an 8 percent decline in degrees conferred over this period (Display 14, opposite page).

Because the State University does not confer a significant number of doctoral degrees (joint doctoral

DISPLAY 13 University of California Ph.D. Program Enrollment and Degrees Conferred, by Citizenship Status, with Indexed Four-Year Percentage Growth, 1976-1988

Status	1976	1980	1976 to 1980 Percentage Change	1984	1976 to 1984 Percentage Change	1988	1976 to 1988 Percentage Change
Ph.D. Enrollment							
Non-Resident Alien	2,234	2,390	7%	3,592	61%	4,798	115%
U.S. Citizen	10,591	10,683	1%	11,045	4%	13,181	24%
Total	12,825	13,073	2%	14,637	14%	17,979	40%
Ph.D. Degrees Conferred							
Non-Resident Alien	354	321	-9%	340	-4%	489	38%
U.S. Citizen	1,714	1,709	0%	1,724	1%	1,808	5%
Total	2,068	2,030	-2%	2,064	0%	2,297	11%

Note: Data excludes students in professional schools, master's degree programs, and interns and residents.

Source: California Postsecondary Education Commission IPEDS Data Base, 1976, 1980, 1984, and 1988.

DISPLAY 14 California State University Post-Baccalaureate Enrollment and Degrees Conferred, with Percentage Change, 1980-1988

Category	1980	1988	Percentage Change
Enrollment			
Post-Baccalaureate			
Total	32,941	33,975	3.0%
Full-Time	8,224	8,943	9.0
Part-Time	24,717	25,032	1.0
Master's			
Total	34,005	36,078	6.0
Full-Time	6,534	6,194	-5.0
Part-Time	27,471	29,884	9.0
Doctoral	56	124	121.0
Full-Time	7	1	-86.0
Part-Time	49	123	151.0
Total	67,002	70,177	5.0%
Degrees Conferred			
Master's Degree	9,732	8,960	-8.0%
Doctorate	6	19	217.0
Total	9,738	8,979	-8.0%

Source: California Postsecondary Education Commission IPEDS Data Base, 1980 and 1988.

programs notwithstanding), its graduate programs will not contribute substantially to meeting its faculty demand or that of the University of California and other four-year colleges and universities, where the doctorate is generally required. However, projected faculty turnover and growth in the community colleges makes graduate education planning in the State University central to the community colleges' ability to attract sufficient faculty for the future. Currently, the California State University projects that its total graduate enrollments will increase by only 8 percent between now and 2005, casting doubts on whether this level of production will be sufficient to meet community college faculty demand over the same period. As noted earlier, the community colleges anticipate a total demand of over 22,000 new faculty, of which approximately 40 percent would ordinarily be drawn from the State University. These factors contribute strongly to the conclusion that the State University may need to rethink its master's degree program plans because of the dramatic enrollment growth and faculty turnover projections coming from the community colleges.

The State University has recently concluded an internal study of graduate education in that segment (Board of Trustees' Agenda, May 15-16, 1990), resulting in numerous recommendations for improvement in the quality of and access to these programs. That study did not focus on the enrollment levels and degree production that will be required from these programs to meet California's needs in the twenty-first century. However, it is becoming increasingly clear, especially in light of the community college projections, that the issue of graduate growth in the State University must become a central issue as graduate planning in California moves forward.

Undergraduate productivity

In addition to improving graduate retention and shortening time to the doctorate, efficiency in Ph.D. production is also strongly influenced by the effectiveness of undergraduate programs. Just as it is important for doctoral-granting institutions to be concerned that they are contributing their share toward an adequate supply of Ph.D.s, it is essential that as part of their mission, baccalaureate institutions pay attention to providing adequate numbers of qualified bachelor degree recipients to fill the doctoral pipeline. This function can be seen as the productivity with which an institution's undergraduate instructional component produces students who go on to obtain the doctorate. An analysis by Carol H. Fuller looked at this very issue by ranking all accredited baccalaureate granting institutions nationally in terms of their productivity in graduating students who obtained the Ph.D. (controlling for the size of the institutions). Not surprisingly, small, highly selective liberal arts colleges and a few leading technical institutions dominated these productivity rankings, rather than graduate-oriented universities (Display 15, page 24).

It is not clear whether the high baccalaureate-to-Ph.D. productivity achieved by the institutions in Fuller's study was a function of the selectivity of the leading institutions or some other institutional

DISPLAY 15 Institutions Ranking Among the Most Effective in Encouraging Their Bachelor's Degree Recipients to Obtain the Doctorate

Amherst	Haverford	**University of California, Riverside**
Antioch	Kalamazoo	
Carleton	New College	Swarthmore
Chicago	Oberlin	Wabash
Grinnell	**Pomona**	Wesleyan
Harvard	Reed	Wooster

Note: Data are based on an examination of productivity for all accredited institutions, for Ph.D.s earned during the years 1951-1980. The productivity ratios were computed by dividing the average number of Ph.D.s conferred per year (1951-1980) by the average number of bachelor's degrees conferred per year (1946-1976) for each institution.

Source: Fuller, 1986, p. 44.

characteristics that encouraged pursuit of advanced programs, but a strong focus on undergraduate instruction is certainly one of the distinguishing characteristics of these highly effective colleges. The Riverside campus of the University of California may be a case in point. While it is selective in its own right, it generally would not be considered among the most selective institutions in the nation. Nevertheless, it was one of the few institutions nationally that ranked as the most productive in all fields of study measured.

Similarly, the University's campuses at Irvine, San Diego, Santa Barbara, and Santa Cruz, which were much smaller during the period of Fuller's study, were all ranked highly productive in several fields of study. Like Riverside, these campuses all shared relatively low proportional graduate student enrollments -- a particularly interesting fact in light of recent University proposals to increase graduate enrollments dramatically at these campuses. On the other hand, the Berkeley and Los Angeles campuses of the University are highly selective undergraduate institutions with high levels of graduate enrollment, and both ranked near the bottom among the University's campuses in the rate of their baccalaureate recipients who completed doctoral programs.

As the Commission has noted extensively elsewhere, the coming era of growth must be grounded in the assumption that expansion not take place in an environment of "business as usual." The evidence thus far indicates that graduate education is most productive and efficient in those programs and institutions that focus substantial resources and attention on instruction and research at the graduate level. Conversely, at the undergraduate level the greatest productivity, efficiency, and by many measures, quality, is enjoyed by those campuses whose mission and resources are focused on undergraduate instruction. As a result, a continuing examination of the factors contributing to excellence and productivity at both the graduate and undergraduate levels appears warranted, with particular emphasis on whether or not the institutional characteristics contributing to excellence at each level are in fact complementary or in some cases mutually exclusive.

4 *The Need to Diversify the Faculty*

THE TREMENDOUS turnover in the professorate expected over the next 15 years offers a unique and, at least for this generation, a one-time opportunity to significantly diversify the faculty ranks with respect to groups historically underrepresented among the faculty. Unfortunately, thus far the ability of higher education to take advantage of this opportunity has been almost universally abysmal.

Progress at the national level

From the late 1950s through the mid 1970s, the number of women and underrepresented students in graduate education increased substantially, but this growth has slowed or actually declined in the past decade. For example, Displays 6 and 7 on pages 16 and 17 show, between 1978 and 1988 the number of American Black males receiving Ph.D.s dropped from 584 to 311 while the number of Latino male American citizens remained almost unchanged (317 to 321) and that of American Black women increased only slightly (449 to 494).

More disturbing still is the fact that in 1988, across the nation, only one Black and three Latino Americans received Ph.D.s in mathematics; only one Black and two Latino Americans received Ph.D.s in computer science; only three Black Americans received Ph.D.s in any foreign language; and only six Latino Americans received Ph.D.s in political science (Display 16, page 26). Finally, Asian students have made little progress in the humanities and social sciences. Nationally in 1988, only four Asian students received Ph.D.s in political science and international relations, one in communications, and five in any of the foreign languages.

Clearly, the prospects nationally for replacing the current faculty with one that is more ethnically diverse are doomed if these trends are not reversed almost immediately.

Progress in California

At the University of California, the trends are mixed. On the one hand, the enrollment of Latino Ph.D. students increased by 63 percent from 1980 to 1988, and degrees conferred to Latinos increased by over 65 percent. While these increases are calculated from disappointingly low base numbers, that nine-year improvement was nevertheless substantial. On the other hand, the enrollment of Black Ph.D. students reflected national trends and actually dropped by 2.3 percent between 1980 and 1988. Black women posted enrollment gains of 10.5 percent, but Black men suffered enrollment losses of 12.5 percent. Doctoral degrees conferred to the University's Black students increased by 8.3 percent between 1980 and 1988, although those gains were exclusively the result of progress achieved between 1980 and 1984. Since that time, Ph.D.s conferred to Black students have actually declined by 17 percent. (Displays 17 and 18, pp. 27 and 28.)

These data indicate that the University of California is sustaining progress in ethnically diversifying the graduate student ranks at rates substantially above the national average. Nevertheless, despite this progress, at these rates the University will not produce adequate numbers of Ph.D. recipients from historically underrepresented backgrounds to substantially diversify California's faculty ranks in the coming 15 years.

Aside from the moral issues associated with improving these numbers, the changing ethnic composition of California's population makes accelerated diversification at all points in the educational pipeline a prerequisite to the continued economic, political, and social health of the State. In 1970, California's White population accounted for approximately 70 percent of its total population, but by 2020, only 30 percent of California's population will be White. Persons from historically underrepresented backgrounds comprise the fastest growing portion of California's undergraduate enrollment (the prime market for future Ph.D.s), not to mention the population as a whole. As noted earlier, the rate at which

DISPLAY 16 Race/Ethnicity and Major Field of American Citizen Ph.D. Recipients, 1988

Field of Doctorate	Total U.S.[1]	American Indians	Asians	Blacks	Latinos/ Hispanics	Whites
Total, All Fields	22,789	93	612	805	594	20,685
Physical Sciences	3,136	11	111	32	69	2,913
Physics/Astronomy	689	1	19	11	13	645
Chemistry	1,343	5	47	17	43	1,231
Earth, Atmospheric, and Marine Sciences	496	2	8	2	8	476
Mathematics	331	2	17	1	3	308
Computer Sciences	277	1	20	1	2	253
Engineering	1,734	4	141	19	43	1,527
Life Sciences	4,319	18	127	71	84	4,019
Biological Sciences	3,070	6	100	36	61	2,867
Health Sciences	642	5	16	25	10	586
Agricultural Sciences	607	7	11	10	13	566
Social Sciences (including Psychology)	4,252	12	85	158	133	3,864
Psychology	2,611	7	37	96	89	2,382
Anthropology	254	2	3	5	10	234
Economics	421	0	22	11	8	380
Political Science and International Relations	261	0	22	11	8	244
Sociology	311	2	8	14	13	274
Other Social Sciences	394	1	11	25	7	350
Humanities	2,743	7	37	77	94	2,528
History	488	1	10	8	13	456
American and English Languages and Literature	906	3	11	26	21	845
Foreign Languages and Literature	273	0	5	3	46	219
Other Humanities	1,076	3	11	40	14	1,008
Education	5,214	35	82	370	152	4,575
Teacher Education	375	3	8	31	10	323
Teaching Fields	776	2	10	49	25	690
Other Education	4,063	30	64	290	117	3,562
Professional and Other	1,391	6	29	78	19	1,259
Business and Management	598	4	16	16	4	558
Communications	184	0	1	10	2	171
Other Professional Fields	582	2	12	52	13	503
Other Fields	27	0	0	0	0	27

1. Includes only those doctorates whose citizenship status and racial/ethnic group are known.

Source: Adapted from National Research Council, 1989, p. 19.

DISPLAY 17 Race-Ethnicity and Sex of Ph.D. Recipients at the University of California, 1978-1989

Status	Year of Doctorate											
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Total	1,890	1,914	2,030	2,111	1,983	2,084	2,064	2,012	2,065	2,023	2,297	2,307
Men	1,458	1,444	1,496	1,093	1,404	1,463	1,431	1,363	1,375	1,385	1,584	1,534
Women	432	470	534	431	575	609	623	642	686	638	711	761
American Indian	5	5	3	6	5	6	7	6	9	6	10	5
Men	4	2	2	4	4	3	7	2	4	3	6	2
Women	1	3	1	2	1	3	0	4	5	3	4	3
Asian/ Pacific Islander	58	57	83	79	100	117	126	126	118	113	136	157
Men	47	45	66	55	67	88	94	87	83	81	102	114
Women	11	12	17	24	33	29	32	39	35	32	34	43
Black	36	36	36	40	34	33	47	24	35	36	39	31
Men	22	25	20	18	19	17	29	12	16	21	20	14
Women	14	11	16	21	15	16	18	12	19	15	19	17
Filipino	2	0	0	2	3	2	2	3	1	3	3	4
Men	2	0	0	0	2	1	1	3	1	2	2	3
Women	0	0	0	2	1	1	1	0	0	1	1	1
Latino/ Hispanic	27	27	41	19	45	45	49	49	59	55	68	60
Men	19	22	35	17	30	31	31	34	35	33	44	35
Women	8	5	6	2	15	14	18	15	24	22	24	25
White	1,232	1,150	1,245	954	1,102	1,239	1,238	1,206	1,214	1,191	1,341	1,284
Men	926	851	883	651	753	836	818	776	741	758	856	770
Women	306	299	362	303	349	403	420	430	473	433	485	514
Non-Resident Alien	313	285	321	246	300	359	340	354	411	400	489	540
Men	276	243	276	217	266	307	284	294	345	336	407	439
Women	37	42	45	29	34	52	56	60	66	64	82	101
No Response/ Other	217	354	301	765	394	283	255	244	218	219	211	226
Men	162	256	214	131	263	180	167	155	150	151	147	157
Women	55	98	87	48	127	91	78	82	64	68	62	57

Note: Men and women may not always add to total due to some reporting of "unknown sex."

Source: HEGIS/IPEDS Data Base, California Postsecondary Education Commission, 1978-1989.

DISPLAY 18 *Race/Ethnicity and Major Field of Study of Ph.D. Recipients at the University of California, 1989*

	Total Domestic Residents	American Indian	Asian/Pacific Islander	Black	Filipino	Latino Hispanic	White	No Response/Other	Non-Resident Alien	Grand Total
Total, All Fields	1,767	5	157	31	4	60	1,284	226	540	2,307
Physical Sciences	363	2	39	1	2	8	273	38	145	508
Physical Sciences	287	2	28	1	1	7	217	31	76	363
Computer and Information Sciences	34	0	6	0	0	0	25	3	20	54
Mathematics	42	0	5	0	1	1	31	4	49	91
Engineering	204	0	39	0	1	4	123	37	169	373
Life Sciences	497	2	42	8	1	16	379	49	110	607
Life Sciences	350	2	32	5	1	12	255	43	74	424
Agribusiness and Agricultural Production	12	0	0	0	0	1	10	1	2	14
Agricultural Sciences	12	0	0	0	0	0	12	0	13	25
Health Sciences	105	0	9	3	0	2	87	4	18	123
Renewable Natural Resources	18	0	1	0	0	1	15	1	3	21
Social Sciences	310	1	17	12	0	16	225	39	55	365
Social Sciences	231	1	12	10	0	12	163	33	52	283
Area and Ethnic Studies	8	0	0	0	0	0	6	2	0	8
Psychology	71	0	5	2	0	4	56	4	3	74
Humanities	196	0	6	5	0	9	141	35	22	218
Foreign Languages	51	0	1	1	0	3	33	13	8	59
Letters	86	0	2	2	0	5	69	8	6	92
Philosophy and Religion	15	0	0	0	0	0	11	4	3	18
Visual and Performing Arts	44	0	3	2	0	1	28	10	5	49
Education	115	0	9	3	0	4	86	13	16	131
Professional	46	0	4	1	0	1	34	6	22	68
Architecture and Environmental Design	9	0	2	0	0	1	4	2	6	15
Business and Management	22	0	1	0	0	0	17	4	11	33
Law	4	0	0	0	0	0	4	0	0	4
Library and Archival Sciences	8	0	0	1	0	0	7	0	1	9
Public Affairs	7	0	1	0	0	0	6	0	4	11
Other	36	0	1	1	0	2	23	9	1	37
Liberal/General Studies	2	0	0	0	0	0	1	1	0	2
Multi/Interdisciplinary Studies	30	0	1	1	0	2	18	8	1	31

Source: IPEDS Data Base, California Postsecondary Education Commission, 1989.

institutions granting the bachelor degree prepare and encourage students to pursue graduate programs will also be a central factor in whether or not there will be an adequate flow of students *overall* to supply growth in graduate education. This is an even more important consideration when considering the need to encourage undergraduates from underrepresented backgrounds to pursue advanced degrees. As Display 19 below shows, even though several University campuses appear in the rankings of institutions whose baccalaureate graduates eventually earn the Ph.D., the University has much room for improvement when it comes to encouraging underrepresented students to pursue graduate programs. This is especially true for Black students, where the ten institutions that awarded the most bachelor's degrees to Blacks who became Ph.D.s were almost all were historically Black institutions.

California's past difficulties in successfully incorporating these students into graduate programs, coupled with the demographic changes currently underway in the State, require that any effort aimed at addressing the coming Ph.D. shortage must also be fully integrated with strategies designed to diversify the undergraduate and graduate student popula-

DISPLAY 19 ***Baccalaureate Institutions Whose Bachelor's Degree Recipients Received Ph.D.s, by Race/Ethnicity, Ranked on Number of Ph.D.s (1986-1988)***

Institution	Number
Asians	
University of California, Berkeley	104
University of Hawaii, Manoa	102
University of California, Los Angeles	63
Massachusetts Institute Technology	45
University of California, Davis	31
Stanford University	30
University of Illinois, Urbana-Champaign	29
Cornell University	27
University of Washington	27
University of Michigan	26
Blacks	
Howard University	81
Tuskegee University	50
Morgan State University	41
Spelman College	41
Hampton University	38
Jackson State University	36
Southern University	34
Wayne State University	30
North Carolina Central University	30
University of the District of Columbia	29

Institution	Number
Latinos	
University of Puerto Rico, Rio Piedras	232
University of Puerto Rico,Mayaquez	62
University of Texas, El Paso	34
University of Texas - Austin	31
University of California, Berkeley	30
University of California, Los Angeles	30
University of New Mexico	27
University of Miami	25
California State University, Los Angeles	24
University of Florida	22
Whites	
University of California, Berkeley	783
University of Michigan	716
University of Illinois, Urbana-Champaign	667
Pennsylvania State University	652
Cornell University	647
University of Wisconsin - Madison	609
Michigan State University	530
University of California, Los Angeles	528
Ohio State University	500
University of Minnesota - Minneapolis	495

Note: Because of the small numbers of doctorates awarded to American Indians, baccalaureate institutions for this group are not included.

Source: National Research Council, 1989, p. 20.

tions and, hence, the composition of the next generation of faculty.

Conclusion

As the segments move forward in their planning efforts for new faculty and for graduate education, the Commission hopes that particular attention will be paid to the issues raised in this report. The coming years offer the challenge not just to expand graduate education but also to diversify the graduate and faculty ranks, and to improve the environment in which students pursue advanced training. The future holds great dangers for the economic, political, and social health of the State if these challenges are ignored or are not intelligently addressed. On the other hand, with careful, innovative, and integrated planning as well as adequate financial support, California has the opportunity to dramatically expand and improve the advanced training that will prepare its leaders of the next century. This is an opportunity the State cannot afford to miss.

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CALIFORNIA POSTSECONDARY EDUCATION COMMISSION

THE California Postsecondary Education Commission is a citizen board established in 1974 by the Legislature and Governor to coordinate the efforts of California's colleges and universities and to provide independent, non-partisan policy analysis and recommendations to the Governor and Legislature.

Members of the Commission

The Commission consists of 15 members. Nine represent the general public, with three each appointed for six-year terms by the Governor, the Senate Rules Committee, and the Speaker of the Assembly. The other six represent the major segments of postsecondary education in California.

As of February 1990, the Commissioners representing the general public are:

Mim Andelson, Los Angeles;
C. Thomas Dean, Long Beach;
Henry Der, San Francisco;
Seymour M. Farber, M.D., San Francisco;
Rosalind K. Goddard, Los Angeles;
Helen Z. Hansen, Long Beach;
Lowell J. Paige, El Macero; *Vice Chair;*
Cruz Reynoso, Los Angeles; *Chair;* and
Stephen P. Teale, M.D., Modesto.

Representatives of the segments are:

Meredith J. Khachigian, San Clemente; appointed by the Regents of the University of California;

Theodore J. Saenger, San Francisco; appointed by the Trustees of the California State University;

John F. Parkhurst, Folsom; appointed by the Board of Governors of the California Community Colleges;

Harry Wugalter, Thousand Oaks; appointed by the Council for Private Postsecondary Educational Institutions;

Joseph D. Carrabino, Orange; appointed by the California State Board of Education; and

James B. Jamieson, San Luis Obispo; appointed by the Governor from nominees proposed by California's independent colleges and universities.

Functions of the Commission

The Commission is charged by the Legislature and Governor to "assure the effective utilization of public postsecondary education resources, thereby eliminating waste and unnecessary duplication, and to promote diversity, innovation, and responsiveness to student and societal needs."

To this end, the Commission conducts independent reviews of matters affecting the 2,600 institutions of postsecondary education in California, including community colleges, four-year colleges, universities, and professional and occupational schools.

As an advisory planning and coordinating body, the Commission does not administer or govern any institutions, nor does it approve, authorize, or accredit any of them. Instead, it cooperates with other State agencies and non-governmental groups that perform these functions, while operating as an independent board with its own staff and its own specific duties of evaluation, coordination, and planning.

Operation of the Commission

The Commission holds regular meetings throughout the year at which it debates and takes action on staff studies and takes positions on proposed legislation affecting education beyond the high school in California. By law, its meetings are open to the public. Requests to speak at a meeting may be made by writing the Commission in advance or by submitting a request before the start of the meeting.

The Commission's day-to-day work is carried out by its staff in Sacramento, under the guidance of its executive director, Kenneth B. O'Brien, who is appointed by the Commission.

The Commission publishes and distributes without charge some 30 to 40 reports each year on major issues confronting California postsecondary education. Recent reports are listed on the back cover.

Further information about the Commission, its meetings, its staff, and its publications may be obtained from the Commission offices at 1020 Twelfth Street, Third Floor, Sacramento, CA 98514-3985; telephone (916) 445-7933.

PLANNING FOR A NEW FACULTY

California Postsecondary Education Commission Report 90-20

ONE of a series of reports published by the Commission as part of its planning and coordinating responsibilities. Additional copies may be obtained without charge from the Publications Office, California Postsecondary Education Commission, Third Floor, 1020 Twelfth Street, Sacramento, California 95814-3985.

Recent reports of the Commission include:

90-1 Higher Education at the Crossroads: Planning for the Twenty-First Century (January 1990)

90-2 Technical Background Papers to *Higher Education at the Crossroads: Planning for the Twenty-First Century* (January 1990)

90-3 A Capacity for Learning: Revising Space and Utilization Standards for California Public Higher Education (January 1990)

90-4 Survey of Space and Utilization Standards and Guidelines in the Fifty States: A Report of MGT Consultants, Inc., Prepared for and Published by the California Postsecondary Education Commission (January 1990)

90-5 Calculation of Base Factors for Comparison Institutions and Study Survey Instruments: Technical Appendix to *Survey of Space and Utilization Standards and Guidelines in the Fifty States*. A Second Report of MGT Consultants, Inc., Prepared for and Published by the California Postsecondary Education Commission (January 1990)

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90-20 Planning for a New Faculty: Issues for the Twenty-First Century. California's Projected Supply of New Graduate Students in Light of Its Need for New Faculty Members. (September 1990)

90-21 Supplemental Report on Academic Salaries, 1989-90: A Report to the Governor and Legislature in Response to Senate Concurrent Resolution No. 51 (1965) and Subsequent Postsecondary Salary Legislation. (September 1990)